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strongly monomodal curves, the former with the mode at 13, the latter with the mode at 5, thus supporting LUDWIG's view as to the prevalence of the terms of the Fibonacci series as modal numbers in the variation curves for ray-flowers. (c) Individual variation is shown in several tables, including about 70 individuals of *Anthemis* and 40 individuals of *Achillea*. These show that considerable differences occur, but so far as can be seen each habitat studied shows about the same series of individual variabilities. (d) Collections of the same species from different localities show little place-variation except in one instance. The number of rays in the heads of *Achillea* are only four in a much larger percentage of the heads at Ames, Iowa, than at three other localities from which material was secured. (e) Collections of *Anthemis* in a single habitat near Ames, in August and again in September, show a somewhat higher average number of rays at the time of the earlier collection, in this agreeing with results reached by the reviewer in the genus *Aster*. The modal number was 13 in both collections. It is stated that greater variability was observed in the ray-flowers of *Anthemis* growing in rich soil than elsewhere, but the data upon which this statement rests do not appear in the tables.

The number of seeds of the lotus, *Nelumbium luteum*, as it occurred in the western part of Lake Erie in 1902, has been studied statistically by PEARL,⁹ who finds that the distribution of the variates gives a good example of the normal curve with the following constants: average 24.874 ± 0.078 , standard deviation 4.339 ± 0.055 , coefficient of variation 17.445 ± 0.162 . A complete analysis of the curve is made and its departures from the theoretical are accounted for as due to random sampling. An interesting numerical relation bearing upon the distribution of fecundity is pointed out. It appears that capsules bearing fewer than the median number of seeds produce only 42.96 per cent. of the total number of seeds, while the remaining 57.04 per cent. are borne by plants which severally produce more than the median number. This fact is conditioned by the normal form of the curve. The maintaining of the normal curve would seem to require either that the inheritance of seed-number is inappreciable or that there is unequal elimination of the seeds coming from large and from small heads.—G. H. SHULL.

Development of the seed of Alsinoideae.—Miss GIBBS,¹⁰ in working over the development and germination of the seed in the subfamily Alsinoideae, of the Caryophyllaceae, has shown that in these features there is a marked uniformity in this group, with evidences of a progressive specialization showing a trend from the Sperguleae to the Alsineae. The latter is indicated especially by an increase in size, and presumably in efficiency as an absorbing organ, of the suspensor; and also by the increased specialization of the inner layer of the outer integument, which is believed to serve as a water jacket in the developing seed. The structure

⁹ PEARL, R., Variation in the number of the seeds of lotus. Amer. Nat. 40:757-768. figs. 4. 1906.

¹⁰ GIBBS, L. S., Notes on the development and structure of the seed in the Alsinoideae. Annals of Botany 21:25-55. pls. 5-6. figs. 4. 1907.

of the chalazal region of the seed was studied in some detail, and the attempt is made to correlate the structure with the functions of this region in conveying food to the young seed after the cutinization of its coats, and in providing for the necessary gaseous interchange with the seed.

The embryo-sac is developed, without division to tapetum or megasporos, from a hypodermal cell of the ovule. The antipodals are evanescent, and the multinucleate endosperm-sac grows to occupy the whole peripheral region of the campylotropous ovule, and is finally filled by the strongly curved embryo. The endosperm is a single layer of cells throughout, though much thicker in the micropylar cap of endosperm which covers the radicle in the mature seed. This part of the endosperm seems the more important, and evidently serves the part of a digesting and absorbing structure in transferring food material from the nucellus to the embryo during its later intraseminal development and the early stages of germination. This function is indicated by the position of the endosperm, by the nature of its cell contents, and by the fact that seeds from which the endosperm has been removed do not germinate.

This work of Miss GIBBS adds another series of perisperm-containing seeds to those in which JOHNSON¹¹ and LEWIS¹² have shown that the endosperm is not for the storage of food for the embryo, but serves to digest and pass on to the embryo, before and during germination, the starch stored in nucellar tissue.—DUNCAN S. JOHNSON.

The structure of *Trigonocarpus*.—SCOTT and MASLEN¹³ have been investigating the structure of certain species of *Trigonocarpus*, a common seed-genus of the British Coal-measures. The species discussed are *T. Parkinsoni*, which name replaces the more familiar *T. olivaeforme*, and *T. Oliveri*, a new species. The general oval form of the winged body of the seed and its very prominent micropylar beak are the familiar features. The testa is distinctly cycadean in character, the outer fleshy and the stony layers being very evident, while there are traces of the inner fleshy layer. The micropylar beak is often as long as the body of the seed, and in some specimens twice as long, and is peculiar in bearing two broad wings, whose real nature is problematical. The nucellus and testa are free throughout, a feature, presumably an ancient one, belonging to certain paleozoic seeds. The vascular system of the seed is in general that described by OLIVER for *Stephanospermum*, namely, an outer system running in the outer fleshy layer, and an inner system traversing the nucellus. This nucellar system in *Trigonocarpus* is quite conspicuous, forming a “practically continuous sheath” in the lower part of the nucellus, and traceable through the whole length of the nucellus, almost to the base of the pollen chamber. The pollen chamber is rela-

¹¹ BOT. GAZETTE 34:321-340. pls. 9, 10. 1902.

¹² BOT. GAZETTE 40:79. 1905.

¹³ SCOTT, D. H., and MASLEN, ARTHUR J., The structure of the paleozoic seeds *Trigonocarpus Parkinsoni* Brongniart and *Trigonocarpus Oliveri*, sp. nov. Part I. Annals of Botany 21:89-134. pls. 11-14. 1907.